Active Pacific tropical cyclone season continues

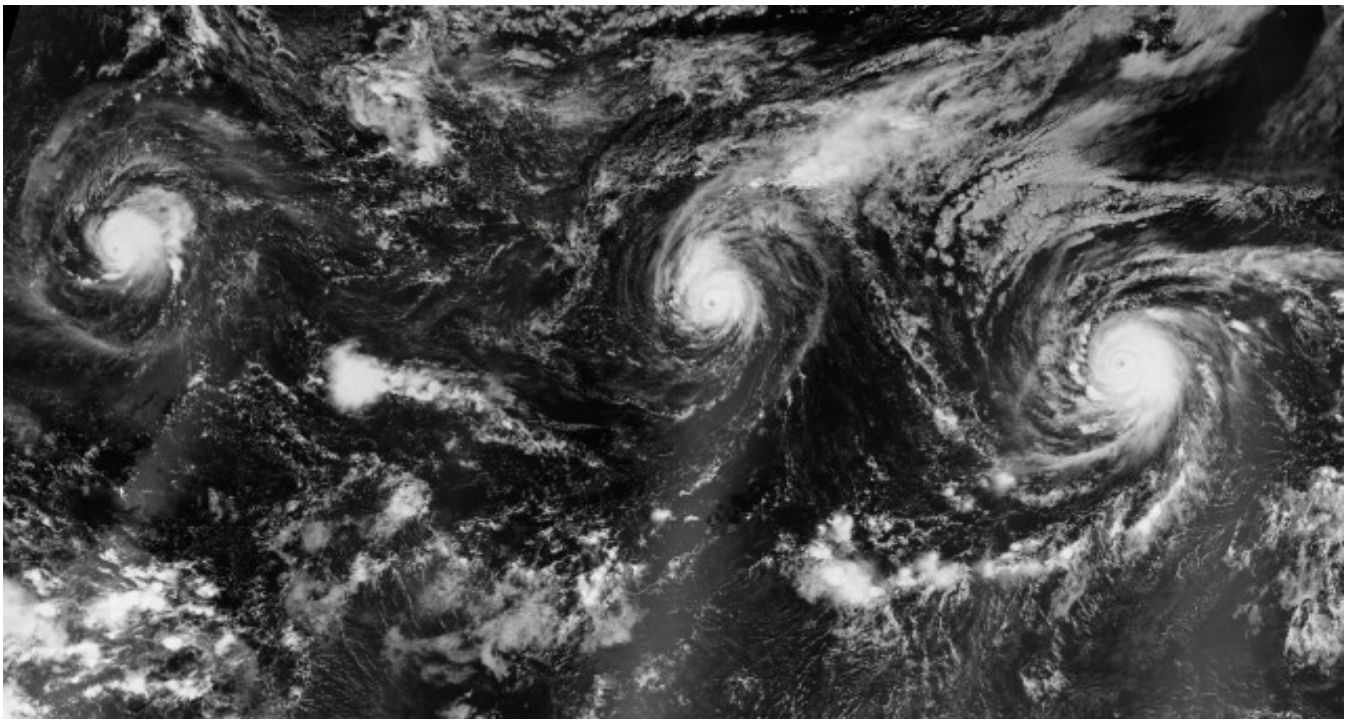
Description

Early September marks the half way point in the northern hemisphere tropical cyclone season and is often the time when we see the highest levels of activity – so how is this season shaping up?

As reported in a news release last week, tropical cyclone activity across the north Pacific has been extremely high this year with numerous intense typhoons in the west Pacific and hurricanes in the east Pacific. These are different names for the same thing – hurricanes occur east of the International Dateline and typhoons to the west.

There has been a fair amount of discussion recently in social and news media as to how 'record-breaking' this season has been so far. Reliable records only go back to about the 1960s or 1970s when satellite coverage of the tropical oceans became available. However, bearing this in mind, here are some of the remarkable statistics for the year up to 1st September:

- There have been 15 tropical cyclones in the northern hemisphere reaching category 4 or 5 on the Saffir-Simpson Hurricane Wind Scale – 6 more than the previous record.
- Tropical cyclone activity across the northern hemisphere as measured by Accumulated Cyclone Energy (a combined measure of intensity and longevity) is 200% of normal and over 20% above any other year.
- Six hurricanes have crossed the central Pacific region – more than any other year.
- Three north Pacific hurricanes have crossed the International Dateline – more than any other year.
- Hurricanes Kilo, Ignacio and Jimena were all at category 4 simultaneously in the Pacific east of the International Dateline – the first time three major hurricanes have been recorded at the same time in this region.


(L-R) Hurricanes Kilo, Ignacio and Jimena on 30 August 2015. Image courtesy of NASA.

Why the high levels of tropical cyclone activity?

One of the main contributing factors is the strong El Niño which has developed. This is characterised by a marked warming of the tropical east Pacific Ocean. Temperature anomalies here are currently at their highest since 1997-98, when high levels of Pacific tropical cyclone activity were also experienced.

What about the Atlantic?

The existence of El Niño conditions usually results in a quiet Atlantic hurricane season. This is primarily as a result of strong wind shear (winds varying in strength and direction with height) across large parts of the region. There have been six Atlantic tropical storms so far this season. Recently Danny became a major hurricane just east of the Caribbean, but quickly succumbed to the strong wind shear as it entered the Caribbean Sea. Erika threatened to develop into a hurricane, but again dissipated in the Caribbean due to a combination of high wind shear and interaction with islands such as Hispaniola.

In the far eastern Atlantic, conditions were favourable enough for a hurricane to quickly spin up as a cluster of thunderstorms moved off the west coast of Africa a few days ago. Fred became the most easterly forming hurricane in the tropical Atlantic Ocean and the first recorded hurricane to hit the Cape Verde Islands since 1892. However, as Fred has continued to move north-westwards it has also been subject to strong wind shear and is weakening rapidly.

What about the rest of the year?

Seasonal model predictions suggest that the strong El Niño will persist for several months to come. Hence it is likely that the high tropical cyclone activity in the Pacific will continue for the remainder of the season. The Atlantic is expected to have a quiet season overall, but this does not exclude the possibility of the development of a major hurricane. There are notable instances of damaging

hurricanes occurring in otherwise quiet seasons such as Hurricane Andrew in 1992 which caused devastation in Miami, Florida.

Official warnings for the latest tropical cyclones in the western North Pacific are produced by the Japan Meteorological Agency. Central Pacific warnings are issued by the Central Pacific Hurricane Center and east Pacific and Atlantic warnings by the US National Hurricane Center. The Met Office routinely supplies predictions of cyclone tracks from its global forecast model to regional meteorological centres worldwide, which are used along with guidance from other models in the production of forecasts and guidance. We also provide updates on current tropical storms via @metofficestorms on Twitter.

Statistics on recent northern hemisphere tropical cyclone activity are courtesy of Dr. Phil Klotzbach of Colorado State University (@philklotzbach).

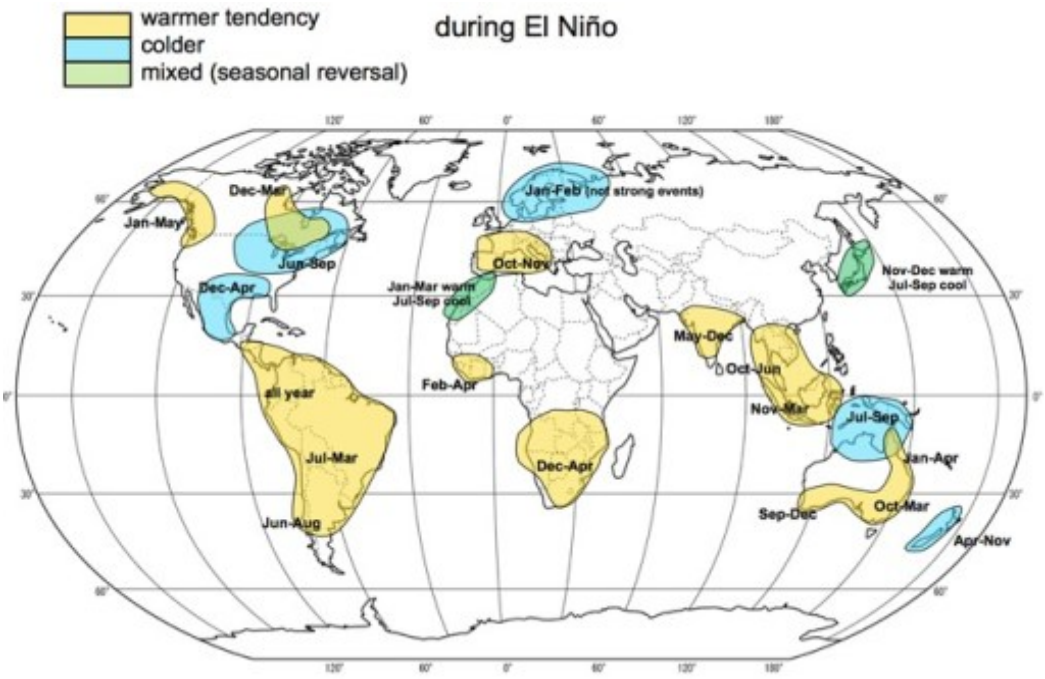
Date Created
September 2015

What do we know about the coming winter?

Description

There has been some speculation in the media today that we may be in for a long, bitterly cold winter because an El Niño is under way in the tropical Pacific. However it is still far too early to speculate about what sort of winter the UK will have.

During an El Niño sea surface temperature in the east Pacific warms, altering weather patterns around the globe. The influence of an El Niño over the UK and western Europe tends to be weaker and less predictable than elsewhere because of how far away we are from the event itself. There is a link in late winter, when we can see a slightly higher risk of a colder than usual end to winter in El Niño years.



This map shows the effect El Nino has on temperatures around the globe.

That's not where it ends when looking at the UK winter, though. Other factors also have an influence, such as sea surface temperature in the North Atlantic, the Sun's output, and changes in winds high in the atmosphere above the Equator known as the Quasi-Biennial Oscillation. These could wipe out the influence from El Niño, and all of them need to be taken into account to predict the winter.

Scientist and Manager of Met Office Predictability Research, Dr Doug Smith, said: “We continue to make improvements in the developing area of long-range forecasting but with all the competing influences in the climate it remains too early to predict the coming winter with much confidence.”

Our 30-day forecasts remain the best way for the public to get a long-range look at the weather we’ll see, while our detailed 5-day forecasts and warnings will keep everyone up-to-date for any periods of severe weather.

Date Created
September 2015

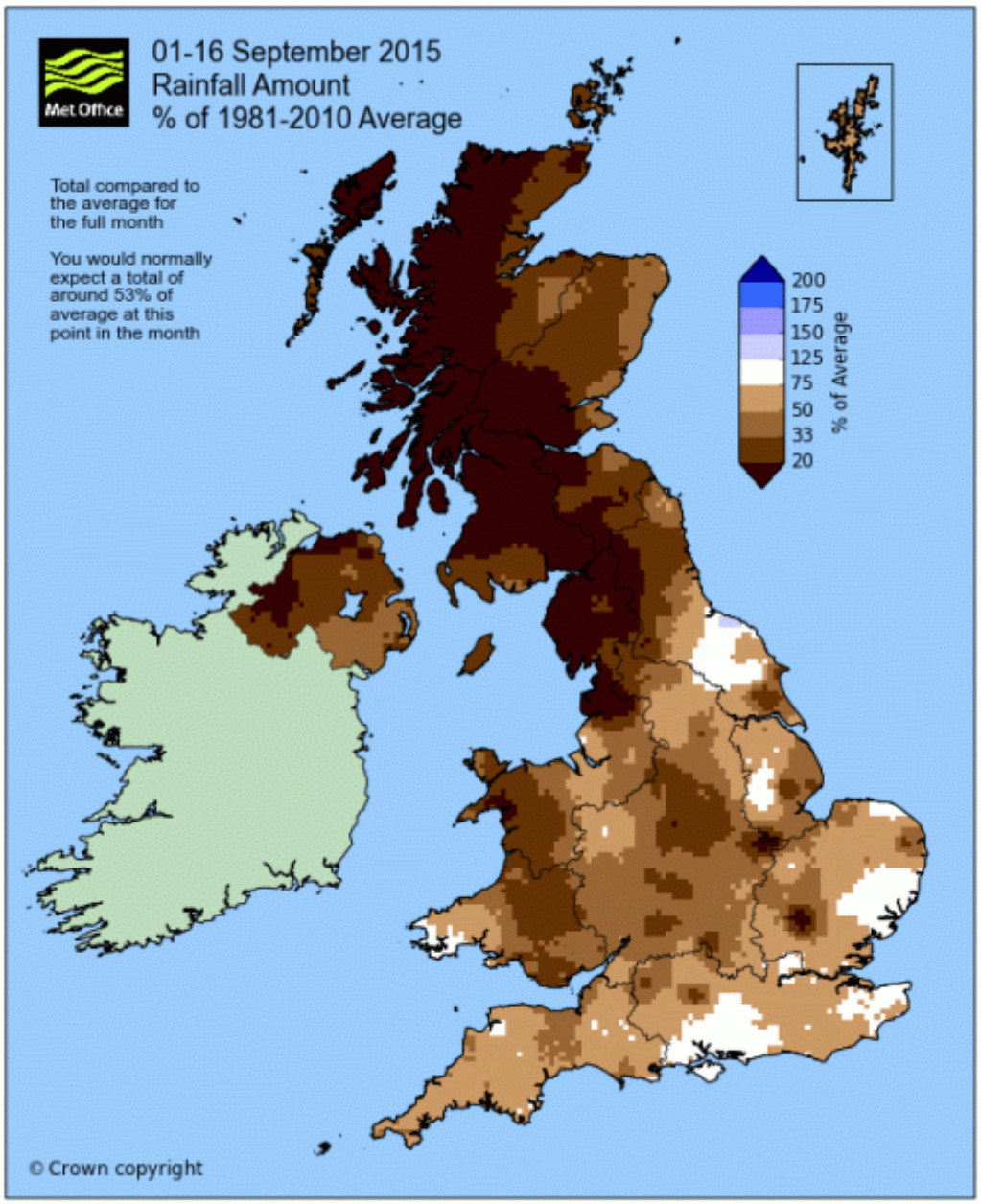
Dry start to September for many

Description

You may think September has been a wet month so far but according to early provisional Met Office statistics, the month has started out drier and sunnier than average for many across the UK.

However the picture has been varied, some parts of southern and eastern England have already had over three quarters of their whole-month average rainfall for September. While northern and western areas have been drier, with little in the way of rain so far for much of Northern Ireland and Scotland away from eastern coasts.

Figures up to 16th September show there has been almost 30mm of rain across the UK, which is just 31% of the September average of 96mm. We would normally expect about half of the average monthly rainfall to have fallen by this point in the month. While there has been almost 72 hours of sunshine, 58% of the monthly average of 125 hours, with some north-western areas being especially sunny so far this month.



01 -16 Sept 2015 Rainfall Amount

Looking at individual countries, Scotland has been the driest with almost 21mm of rain, 15% of average, followed by Northern Ireland with almost 24mm of rain, 26% of average. England is the wettest country so far with almost 34mm 49% of average. There was a dry anticyclonic spell for the UK lasting from 5th until 11th, since then there have been some noticeable falls of rain.

The UK mean temperature so far has been 12.2C, which is 0.4C below the full-month average.

EARLY	**mean temperature**		**sunshine duration**		**precipitation**	
Sep-2015	**Act**	**Anm (8110)**	**Act**	**Anm (8110)**	**Act**	**Anm (8110)**

	degC	degC	hours	%	mm	%
Regions						
UK	12.2	-0.4	71.8	58	29.8	31
England	13.0	-0.8	78.2	57	33.8	49
Wales	12.3	-0.6	73.2	57	42.2	36
Scotland	11.0	0.1	63.6	61	20.9	15
N Ireland	12.2	-0.2	56.1	49	23.9	26

While these figures are interesting, they don't tell us where the month will end up overall. A few days of wet or cold weather could drastically alter the statistics, so we'll have to wait for the full-month figures before making any judgements.

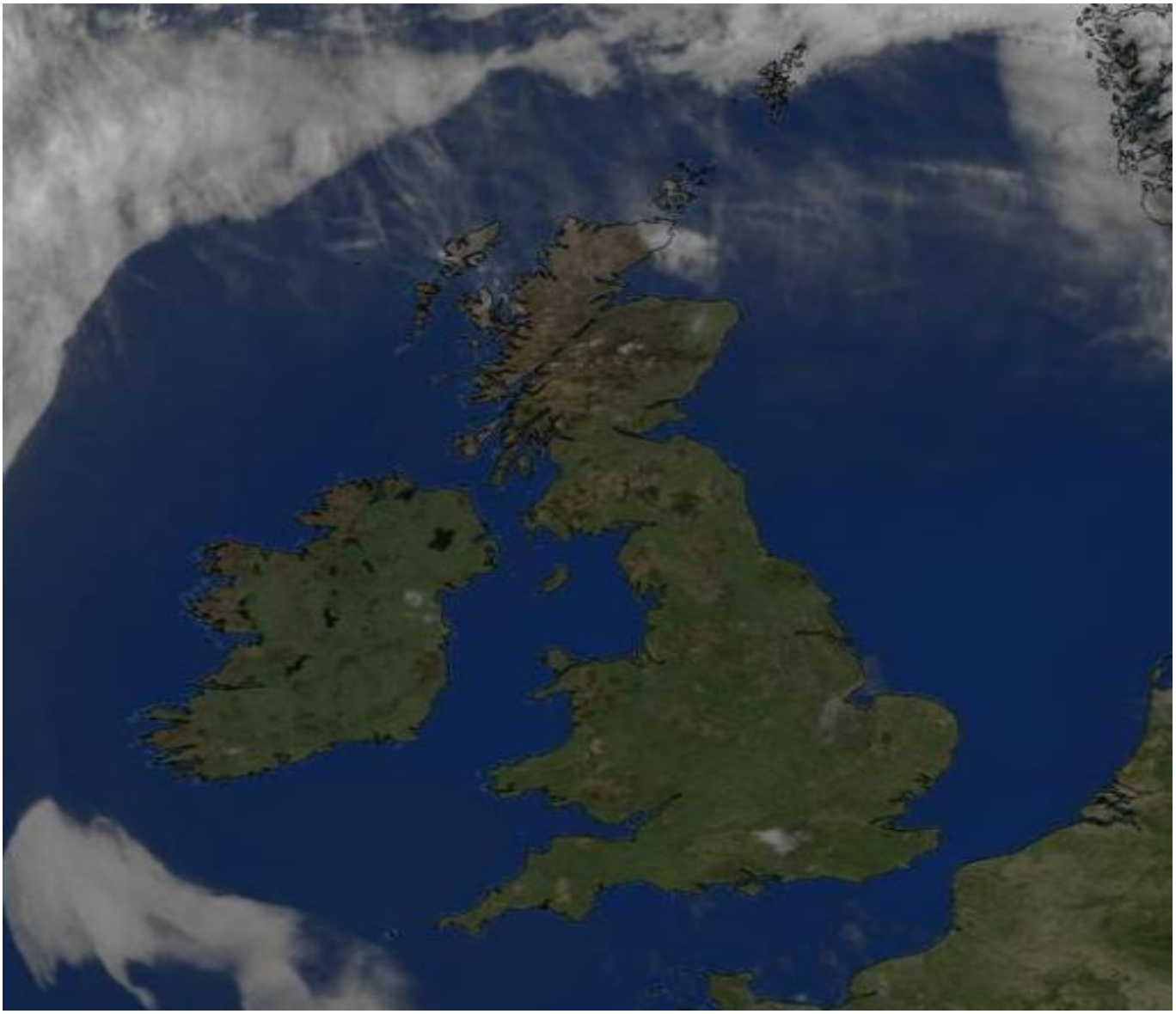
Meanwhile this weekend is looking fine and dry, with good spells of sunshine for many on Saturday and many places seeing settled weather continuing well into Sunday evening. Check out our five day forecast for more details.

Date Created
September 2015

State of the UK climate 2014

Description

Our climate in the UK is changing and therefore it is essential that we record those changes accurately. The foundation for this monitoring comes from our extensive network of meteorological observations. The Met Office National Climate Information Centre is responsible for translating these diverse observations into an understanding of our nation's weather and climate and its longer term historical context. Today we have released a new report called 'State of the UK Climate 2014'.



What is it?
'State of the UK Climate' is a new annual publication that presents a summary of the UK's weather and climate, in this case for 2014, comparing it to historical records to provide long-term context. It is

intended to provide an accessible, authoritative and up-to-date assessment of UK climate trends, variations and extremes based on the latest available climate quality observational datasets.

What does it say?
Some of the important findings of this year's report are:

2014 was the warmest year on record for UK land and coastal waters.

2014 was the fourth wettest year on record for the UK.

8 of the 10 warmest years for the UK have occurred since 2002 and all the top ten warmest years have occurred since 1990.

7 of the 10 wettest years for the UK have occurred since 1998.

Mean sea level around the UK rose by 1.4 millimetres per year (mm/yr) in the 20th Century, when corrected for land movement.

Within its pages you can also discover a host of other facts and figures from days of heavy rain, snow and sunshine hours, a summary of significant weather events in 2014 and the fact that February 2014 saw the highest ever recorded sea level at Newlyn in Cornwall in a 100 year series.

Why now?
We monitor a wide range of observations and will always report our findings as they happen, regardless of whether that be a single severe storm, the hottest year on record, or a relatively benign month. However the eagle-eyed may have noticed that we refer to these statistics as "provisional". This is because we also continue to collect more observations and undertake extensive quality control of the data for a long time after the event. At the completion of this process approximately 6 months later we will then recalculate all our national statistics to include all the best quality data that we can. That is why we are now publishing up to date statistics for the year 2014.

Will this be updated?
Yes. This publication is intended to be the first in a series of annual reports and we expect to publish the summary for 2015 next summer . These will provide the most up-to-date and highest quality UK climate statistics available. Our routine day-to-day and monthly monitoring will also continue, so for those that can't wait we'll still be providing our important real-time monitoring as well.

Feedback
We would also love to hear your feedback or suggestions so that we can improve the publication and make it as useful as possible. While we cannot promise to respond individually to all comments we will be sure to consider them all as we plan the release for 'State of the UK Climate 2015' next summer. Please email all comments to socuk@metoffice.gov.uk.

Find the full report here: State of the UK Climate 2014

Date Created
September 2015

‘Super tides’ this autumn

Description

You may have heard about the potential impact of so-called ‘super tides’ which are due from Saturday 26 September to Saturday 3 October. These tides are enhanced by the autumn equinox which this year fell on Wednesday 23 September. This blog written in conjunction with the Environment Agency provides an explanation of these tides.

So what are ‘super tides’?
Tides are governed by the gravitational pull of the moon and, to a lesser extent, the sun. Because the sun and moon go through different alignment, this affects the size of the tides.

When the gravitational pull of the sun and moon combine, we see larger than average tides – known as spring tides. When the gravitational pulls offset each other, we get smaller tides known as neap tides. We see two periods of spring and neap tides roughly every month.

Yet some spring tides are higher than others. This is because tidal forces are strengthened if the moon is closest to Earth in its elliptical orbit (astronomers call this perigee). Tide forces are also enhanced when the sun and the moon are directly over the equator. For the sun this happens on or around 21 March or September (the equinoxes). Spring tides are always higher at this time of year. The moon’s orbit also takes it above and below the equator over a period of 27.2 days. Just as with the Sun, the tide generating forces are at their greatest when the moon is directly overhead at the equator.

Very large spring tides occur when these astronomical factors coincide. Approximately every 4.5 years the moon is closest to the Earth, and is also overhead at the equator, at either the March or September equinox. Astronomical tide levels through 2014 and 2015 are at their largest in an 18.6 year cycle when the earth, moon and sun align such that they combine to create a greater than normal force over the oceans.

In some places, these extreme tidal conditions can cause water levels to be 0.5m higher than a normal spring tide, but the weather can have a greater impact than even these largest of tides.

What is the role of the weather in sea levels?
It’s important to realise that just because we are expecting higher than normal astronomical tides over the next week, these won’t necessarily cause record sea levels. That’s because the weather can have a much bigger impact on sea level than the 18-year tidal cycle.

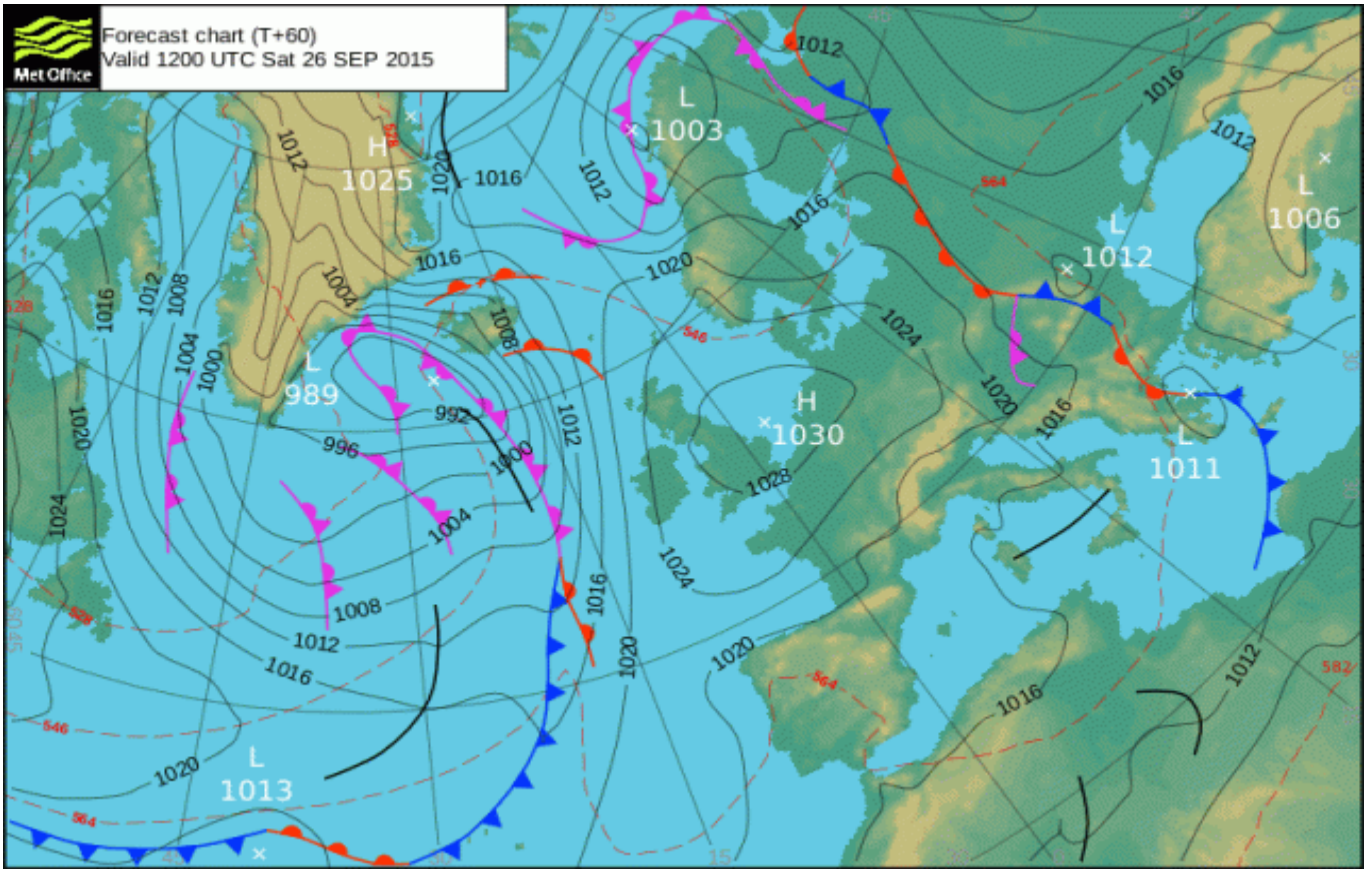
Strong winds can pile up water on coastlines, and low pressure systems can also cause a localised rise in sea level. Typically the difference in water level caused by the weather can be between 20 and 30cm, but it can be much bigger.

On the 5th December 2013, for example, the weather created a storm surge that increased the water level by up to 2 metres. Although an estimated 2,800 properties flooded, more than 800,000 properties were protected from flooding thanks to more than 2,800 kilometres of flood schemes. The Environment

Agency also provided 160,000 warnings to homes and businesses to give people vital time to prepare.

This highlights the importance of the Met Office and the Environment Agency working together to look at the combined impact of astronomical tides, wind, low pressure and waves on flood schemes to assess the potential impacts for communities around our coast.

Will we see coastal flooding associated with these high tides?
High pressure forecast over the next 10 days and so it is unlikely that the weather will enhance water levels over the period of high tides. In fact, the influence of high pressure may actually reduce the water levels slightly. As ever, you can find out more about what weather to expect with the Met Office's forecasts and severe weather warnings.



Surface pressure chart for 1pm Saturday 26 September 2015

The Environment Agency and the Met Office are working together to closely monitor the situation, and the Environment Agency will issue flood alerts and warnings as required.

John Curtin, *Environment Agency's Interim Executive Director of Flood and Coastal Risk Management*, said:
"The flood risk is low over the next few days. Some of the highest spring tides of the year start this weekend but as we are not expecting any unsettled weather, it is unlikely that this will lead to flooding of coastal locations.

"The Environment Agency is monitoring the situation closely alongside the Met Office and local authorities, and will issue flood alerts and warnings if required. People should check their flood risk and

keep up to date with the latest situation at https://www.gov.uk/check-if-youre-at-risk-of-flooding or follow @EnvAgency and #floodaware on Twitter for the latest flood updates."

For those in Scotland, you can see flood updates for your area on the SEPA website here.

For those in Wales, you can see flood updates in English and Welsh on the Natural Resources Wales website here.

You can also see John explaining the Environment Agency's flood warnings here:

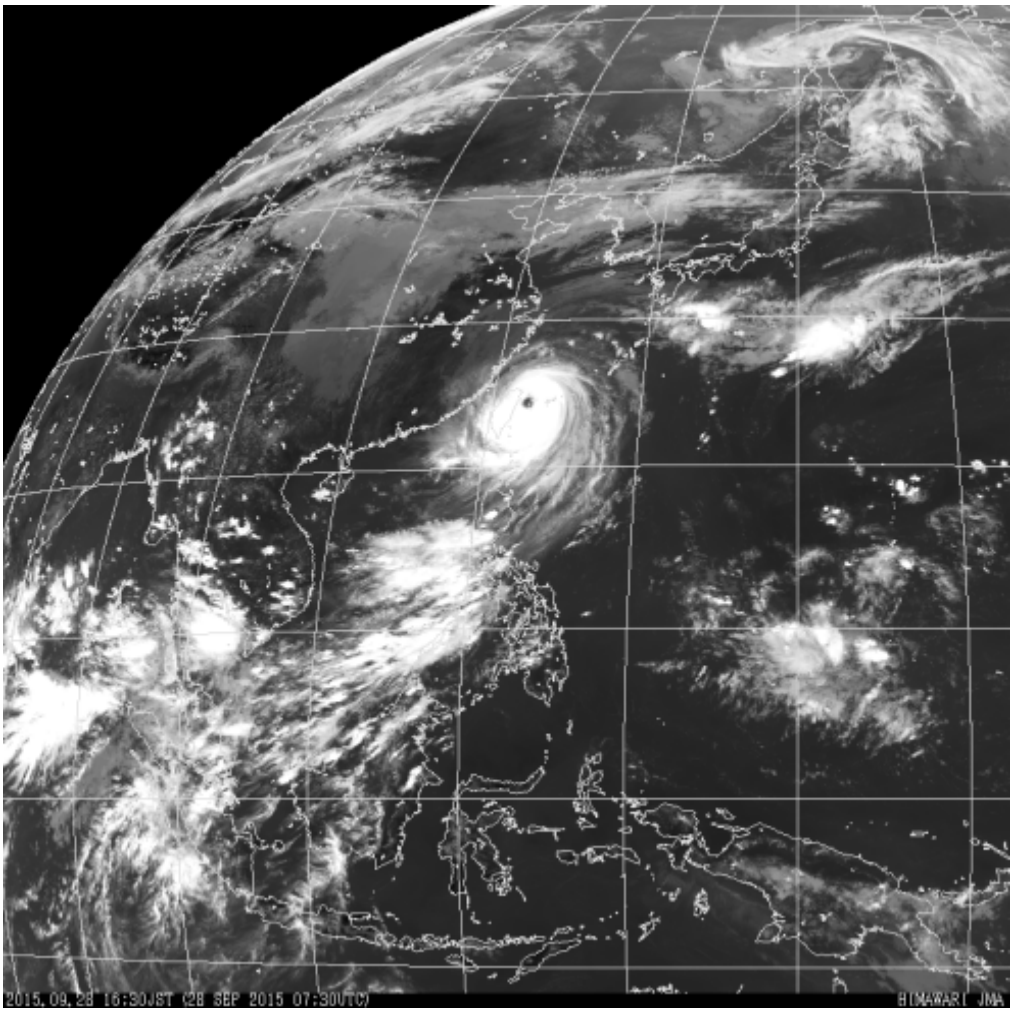
Date Created
September 2015

Typhoon Dujuan strikes Taiwan

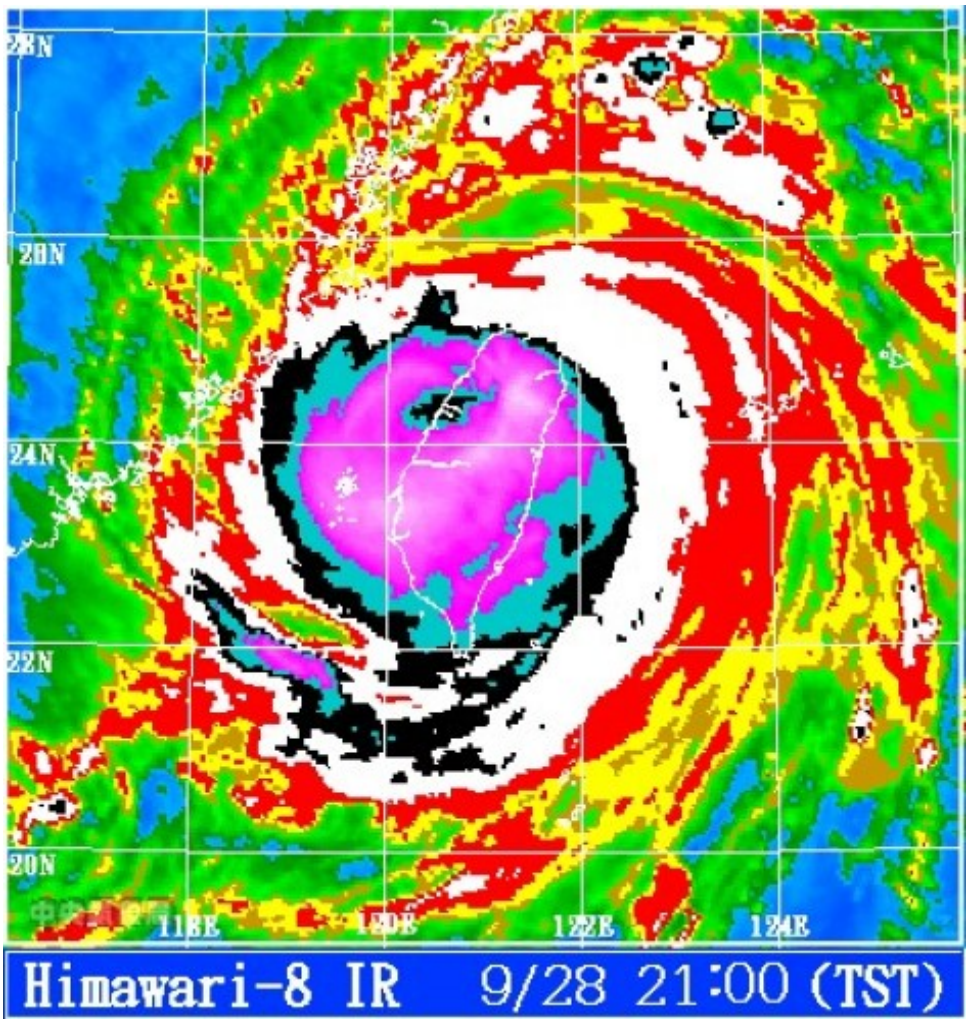
Description

Typhoon Dujuan has today (Monday 28 September) made landfall over Taiwan on the western rim of the Pacific Ocean with sustained winds well in excess of 100 mph. Dujuan is expected to drop large amounts of rainfall – 500mm is possible – over the mountainous interior of the island which could result in serious flooding and landslides. Within the first few hours of the typhoon affecting Taiwan 142mm of rainfall has already been recorded in Taipei.

Dujuan comes just seven weeks after Typhoon Soudelor struck the same part of northern Taiwan with a similar intensity. Soudelor caused flooding, destruction due to strong winds and some loss of life. Dujuan is expected to take a similar track to Soudelor – crossing the Taiwan Strait and reaching the Pacific coast of mainland China tomorrow (Tuesday 29 September) before moving inland.



Typhoon Dujuan just prior to landfall on 28 September 2015
Image courtesy of JMA.



Typhoon Dujuan after making landfall on 28 September 2015
Image courtesy of MTSAT.

Dujuan and Soudelor are two of many strong typhoons and hurricanes which have occurred across the Pacific Ocean this year. One of the main contributing factors to the high level of storm activity is the strong El Niño which has developed. This is characterised by a marked warming of the tropical east Pacific Ocean. A strong El Niño can alter weather patterns in many parts of the world and in particular results in increased Pacific tropical cyclone activity. The last time an El Niño of the current strength occurred was in 1997-8 when high levels of Pacific tropical cyclone activity were also experienced.

In total there have been 43 tropical cyclones across the whole of the Pacific Ocean this year. 19 of these have acquired ‘major’ status – category 3 or above on the Saffir-Simpson Hurricane Wind Scale. The northern hemisphere season usually continues through October and November and in some seasons extends into December as well.

In addition to Typhoon Dujuan there are also two other tropical storms in the Pacific at present. Tropical Storm Niala is located in the central Pacific just south of Hawaii. It is not expected to impact Hawaii directly as it gradually weakens. The central part of the North Pacific Ocean surrounding Hawaii has seen a record number of tropical storms form this season, although Hawaii itself has avoided a direct strike from any of the storms so far.

Over in the far eastern Pacific Ocean Tropical Storm Marty is just under hurricane strength and is moving slowly towards the coast of Mexico. It is not certain yet whether Marty will make landfall, but a tropical storm watch has been issued for coastal areas including the resort of Acapulco.

Official warnings for the latest tropical cyclones in the western North Pacific are produced by the Japan Meteorological Agency. Central Pacific warnings are issued by the Central Pacific Hurricane Center and east Pacific and Atlantic warnings by the US National Hurricane Center. The Met Office routinely supplies predictions of cyclone tracks from its global forecast model to regional meteorological centres worldwide, which are used along with guidance from other models in the production of forecasts and guidance. We also provide updates on current tropical storms via @metofficestorms on Twitter.

Date Created
September 2015

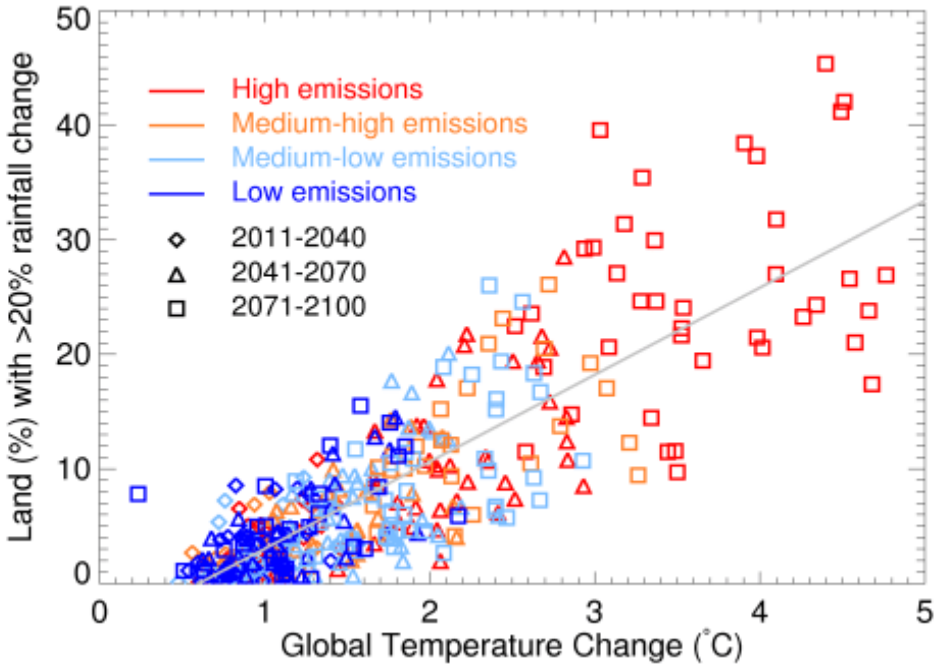
Large changes in tropical rainfall expected due to greenhouse gas emissions

Description

A new Met Office study has found that, if global greenhouse gas emissions are not reduced, we are likely to see large changes to the rainfall in tropical countries.

Scientists found that the size of these changes will be strongly determined by the total amount of greenhouse gases that are emitted.

Many people in tropical regions, which contain some of the least developed countries in the world, are already exceptionally vulnerable to variations in how much and how frequently it rains. Any large, long-term changes to rainfall amounts due to climate change could worsen this vulnerability, and test the ability of societies and wildlife to adapt to potentially unprecedented conditions.



Climate simulations of tropical land rainfall change and global temperature change over the 21st century under four different greenhouse gas emissions scenarios.

To investigate possible changes in future rainfall patterns, Met Office scientists used a large number of climate change simulations of the 21st century, produced by research institutes across the world. All simulations run with high greenhouse gas emissions produced large changes in rainfall patterns across substantial areas of tropical land by the end of the century. On average around one quarter of all

tropical land was affected – an area twice the size of Brazil. Simulations run with lower greenhouse gas emissions showed much smaller areas of land with large rainfall changes.

Which regions are most vulnerable to rainfall change?

Analysis of future climate simulations shows that under high greenhouse gas emissions, large rainfall changes are expected to occur over an even larger area of dry land than was affected during the Sahel drought. Of course the impacts of such changes would be heavily dependent on the resilience of the particular countries affected.

The long-term drought in the Sahel region of West Africa brought famine to hundreds of thousands of people and huge disruption to millions more in the 1970s and 80s. Although not clearly linked to greenhouse gas emissions, the Sahel drought provides a yardstick for the potential impacts of future climate change.

When and why will these changes happen?

Rainfall changes in tropical countries are expected by the end of the 21st century due to climate change affecting a number of the processes which determine where and how much it rains in different parts of the tropics. One of these is the pattern of surface temperatures across the tropical oceans. As rainfall tends to occur over the warmest parts of the oceans, any changes to these patterns can cause large changes to the regions where it rains – this is what happens during an El Niño event.

Exactly where will changes occur?

Exactly which countries will be affected by these future rainfall changes is much less certain, as climate simulations disagree on where the changes will occur. Regions thought to be most at risk of large decreases include southern Africa and Central America, while India and East Africa are among those most likely to experience large increases. However it should be emphasised that the location of changes is much less consistent among climate simulations than the fact that large changes occur.

Date Created
September 2015

Dry, sunny but cool September

Description

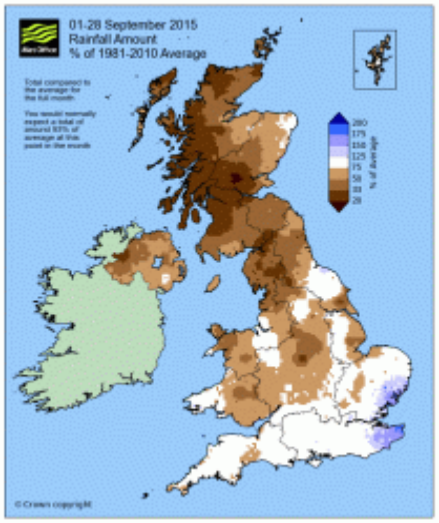
Two spells of settled weather during September have contributed to a rather dry and sunny but cool September.

Provisional statistics for the month show that after a wet end to August, September has been drier than average for much of the UK with figures up to the 28 September showing that there has been 53.3mm of rain, only 55% of the September average of 96.4mm.

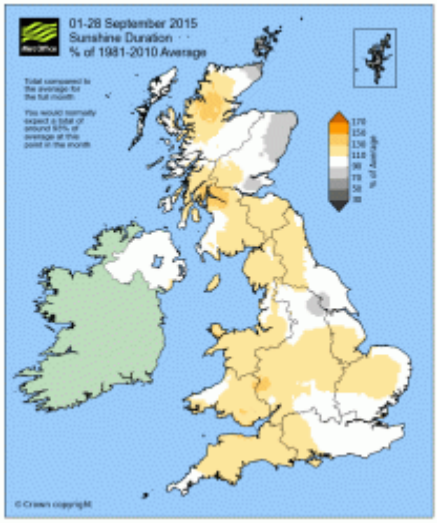
Northern and western Scotland have been particularly dry with only 37% and 31% of the September average for rainfall having been recorded. In comparison, parts of eastern and southeast England have seen above average rainfall. Wales has seen 75mm of rain, 64% of average, while Northern Ireland recorded 51% of the September average for rainfall with a total of 47.1mm.

Many places have enjoyed a sunny month with 137 hours of sunshine recorded across the UK, this is 10% above the average for September.

However, despite the dry and sunny weather conditions, September has seen some rather cool days and nights. Mean temperatures across the UK up until the 28 September are 0.8C below normal with minimum temperatures across England and Wales around 1.5C below the September average. Five UK observing sites have already recorded their first frost of the season.



September 2015 rainfall amount



September 2015 sunshine anomaly

PROVISIONAL	mean temperature		sunshine duration		precipitation	
Sep-2015	Act	Anm (8110)	Act	Anm (8110)	Act	Anm (8110)
	degC	degC	hours	%	mm	%
Regions						
UK	11.9	-0.8	137.2	110	53.3	55
England	12.6	-1.1	152.5	111	52.8	76

Wales	11.8	-1.1	151.9	119	75.0	64
Scotland	10.8	-0.1	112.0	106	49.3	36
N Ireland	11.7	-0.7	113.9	100	47.1	51

The outlook for the first few days of October is for the fine, settled weather to continue before we see a transition towards more changeable weather next week with rain at times. Check out our five day forecast for more details.

Date Created
September 2015